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Remedial Action Report for WAG 5, OU 5-12 Phase I Remedial Action; Sites ARA-02, ARA-16, ARA-25, and Inactive Waste System Sites ARA-07, ARA-08, ARA-13, and ARA-21

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ABSTRACT

This report describes the Phase I remedial action for Waste Area Group 5, Operable Unit 5-12. The sites remediated during this response action included the Auxiliary Reactor Area (ARA)-02 sanitary waste system, ARA-16 radionuclide tank, and ARA-25 soils beneath the ARA-626 hot cells; in addition, four inactive waste systems including the ARA-07 seepage pit, ARA-08 seepage pit, ARA-13 sanitary sewer distribution box and septic tank, and ARA-21 septic tank and Leach Pit No. 2 were closed. The primary remedial action objective for Sites ARA-02, ARA-16, and ARA-25 was to inhibit direct exposure to radionuclide contaminants of concern that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and for future residents. A secondary objective, common to these sites, was to inhibit dermal adsorption of contaminants of concern that would result in a total excess cancer risk greater than or equal to 1 in 10,000 or a hazard index of 2 or greater for current and future workers and future residents. The remedial action goals for each site were achieved by removing the contaminated materials. The four inactive waste systems were included as part of the remedial action to further reduce the hazards within Operable Unit 5-12. The remedial action was completed as described in the Phase I Work Plan, with few exceptions, as detailed in Section 4 of this report.

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FIGURES

TABLES

ACRONYMS

ALARA	as low as reasonably achievable
ARA	Auxiliary Reactor Area
ATG	Allied Technology Group, Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
COC	contaminant of concern
CWSA	CERCLA Waste Storage Area
D&D	decontamination and dismantlement
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FY	fiscal year
HASP	Health and Safety Plan
HAZWOPER	hazardous waste operations and emergency response
HEPA	high-efficiency particulate air
HIC	high-integrity container
ICDF	INEEL CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
OC	organo-chlorinated

OP	organo phosphorous
OU	operable unit
ppm	parts per million
PBF	Power Burst Facility
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RadCon	radiological control
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
SAMS	Surveillance and Monitoring System
SPERT	Special Power Excursion Reactor Test
SSA	Staging and Storage Annex
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
VOC	volatile organic compound
WAG	waste area group

Remedial Action Report for WAG 5, OU 5-12 Phase I Remedial Action; Sites ARA-02, ARA-16, ARA-25, and Inactive Waste System Sites ARA-07, ARA-08, ARA-13, and ARA-21

1. INTRODUCTION

In accordance with the *Federal Facility Agreement and Consent Order* (FFA/CO) (Department of Energy Idaho Operations Office [DOE-ID] 1991) between the Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (IDEQ), hereafter referred to as the Agencies, DOE submits this Final Remedial Action Report for the Auxiliary Reactor Area (ARA) and the Power Burst Facility (PBF). Under the current remediation management strategy outlined in the FFA/CO (DOE-ID 1991), the location identified for the remedial action is designated as Waste Area Group (WAG) 5, Operable Unit (OU) 5-12 at the Idaho National Engineering and Environmental Laboratory (INEEL). The remedial action for WAG 5 is divided into two phases. Phase I is specific to tanks and inactive waste systems located at ARA. Phase II is concerned with the remediation of contamination soils located at both ARA and PBF. Because of the proximity of one of the contaminated soil sites (ARA-25) to that of one of the tank sites (ARA-16), remediation of the site was included in Phase I. This report documents the remediation of the following WAG 5 Phase I sites:

- ARA-02—ARA-I sanitary waste system
- ARA-16—ARA-I radionuclide tank and piping
- ARA-25—ARA-I soils beneath the ARA-626 hot cells.

Additionally, the four inactive waste systems included for closure in the OU 5-12 Phase I remedial design/remedial action (RD/RA) as a best management practice included the following:

- ARA-07—ARA-II seepage pit to the east (ARA-720A)
- ARA-08—ARA-II seepage pit to the west (ARA-720B)
- ARA-13—ARA III sanitary sewer distribution box and septic tank (ARA-740)
- ARA-21—ARA-IV test area septic tank and Leach Pit No. 2.

This report describes the work performed, discusses any modifications to the remedial design, and documents the final status of the remedial action.

As a special note, the remediation of PBF-16 was described in the Record of Decision (ROD) (DOE-ID 2000a) and included as part of the WAG 5 Phase II activities. The need for remediation was based on a single analytical result that indicated the presence of mercury at levels that posed an unacceptable ecological risk. As discussed in the *Waste Area Group 5 Remedial Design/Remedial Action Work Plan, Phase II* (DOE-ID 2000b), additional analytical results indicate that mercury concentrations are below the remediation goal of 0.5 mg/kg. Therefore, the site is no longer considered an unacceptable risk, and no additional remediation of the site is required.

1.1 Organization of the Remedial Action Report

This Remedial Action Report describes the remediation activities associated with Phase I of the WAG 5 remedial action. The following are brief descriptions of the Remedial Action Report sections and appendices.

- Section 1 describes the background and history of WAG 5 and provides an overview of the selected remedies for the areas of concern
- Section 2 summarizes the remedial action activities
- Section 3 outlines the costs incurred during the remedial action
- Section 4 describes the modifications to the Remedial Design/Remedial Action Work Plan
- Section 5 describes the waste streams generated during the remedial action
- Section 6 addresses the prefinal and final inspection checklists
- Section 7 includes the summary and verification of the work performed
- Section 8 provides certification that the remedial action functions as designed and meets the remedial action goals and objectives
- Section 9 lists the references
- Appendix A, As-built drawings detailing remedial action removal activities
- Appendix B, Photographs of the sites and remediation activities
- Appendix C, Sample analytical data summaries
- Appendix D, Prefinal inspection checklist
- Appendix E, In situ gamma measurement systems
- Appendix F, Certificate(s) of destruction.

1.2 Background

Located 51 km (32 mi) west of Idaho Falls, Idaho, the INEEL is a government-owned, contractor-operated facility managed by the DOE-ID (Figure 1-1). Occupying 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain, the INEEL encompasses portions of five Idaho counties including Butte, Jefferson, Bonneville, Clark, and Bingham.

Comprising the ARA and PBF, WAG 5 is in the south-central portion of the INEEL. The ARA consists of four separate operational areas designated as ARA-I, ARA-II, ARA-III, and ARA-IV. Once known as the Special Power Excursion Reactor Test (SPERT) facilities, PBF consists of five separate operational areas: (1) the PBF Control Area, (2) the PBF Reactor Area (SPERT-I), (3) the Waste Engineering Development Facility (SPERT-II), (4) the Waste Experimental Reduction Facility (SPERT-III), and (5) the Mixed Waste Storage Facility (SPERT-IV). Collectively, the Waste Experimental Reduction Facility, Waste Engineering Development Facility, and the Mixed Waste Storage Facility are known as the Waste Reduction Operations Complex.

1.2.1 ARA-02 Sanitary Waste System

The ARA-02 site was a sanitary septic system comprising three tanks in series, a seepage pit, three manholes, and the associated piping. The system was built in 1960 and serviced permanent and temporary ARA-I buildings until 1988 when ARA-I was inactivated. The ARA-02 septic system was designed and intended exclusively for sanitary waste. No known process waste was routed to the system, and no recorded spills or documented incidents were associated with the septic system. However, periodic surveys indicated radiological contamination. The source of the contamination is unknown.

As part of a Track 2 investigation (Pickett et al. 1993), soil samples were collected along the main line and outside of the seepage pit and septic tanks. The contents of the tanks, pit, and main line were also sampled. None of the soil samples yielded concentrations of Resource Conservation and Recovery Act (RCRA)-hazardous constituents. Low levels of beryllium, U-234, U-238, and Sr-90 were detected during the sampling of the pipeline between the septic tanks and the seepage pit. On the basis of the Track 2 risk evaluation, removal of the septic tank contents, confirmation sampling, and a reevaluation of the site in the WAG 5 comprehensive remedial investigation/feasibility study (RI/FS) (Holdren et al. 1999) were recommended. In September 1996, a time-critical removal action was initiated to remove the contents of the three septic tanks.

During the WAG 5 comprehensive RI/FS, boreholes were drilled and samples were obtained from soil adjacent to the first two septic tanks and at the basalt interface. Samples were only collected from shallow soil alongside the third tank because the tank was blasted into basalt. Concentrations of arsenic, lead, Ra-226, Sr-90, U-234, and U-235 were detected in excess of human health contaminant screening levels. In addition, samples were collected from both the interior of the seepage pit and from soils outside of the pit. Contaminants detected in the sludge at concentrations in excess of human health screening levels include Ag-108m, Am-241, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Np-237, Pu-238, Pu-239/240, Ra-226, Sr-90, Tc-99, Th-230, U-234, U-235, U-238, arsenic, cadmium, chromium, copper, lead, nickel, silver, Aroclor-1242, and diethylether. The contaminants detected in the soil surrounding the seepage pit include Am-241, Cs-137, Eu-152, Ra-226, U-234, U-235, U-238, arsenic, chromium, copper, lead, and nickel. Ecologically based screening levels were exceeded for barium, chromium, and copper in the soil outside of the seepage pit.

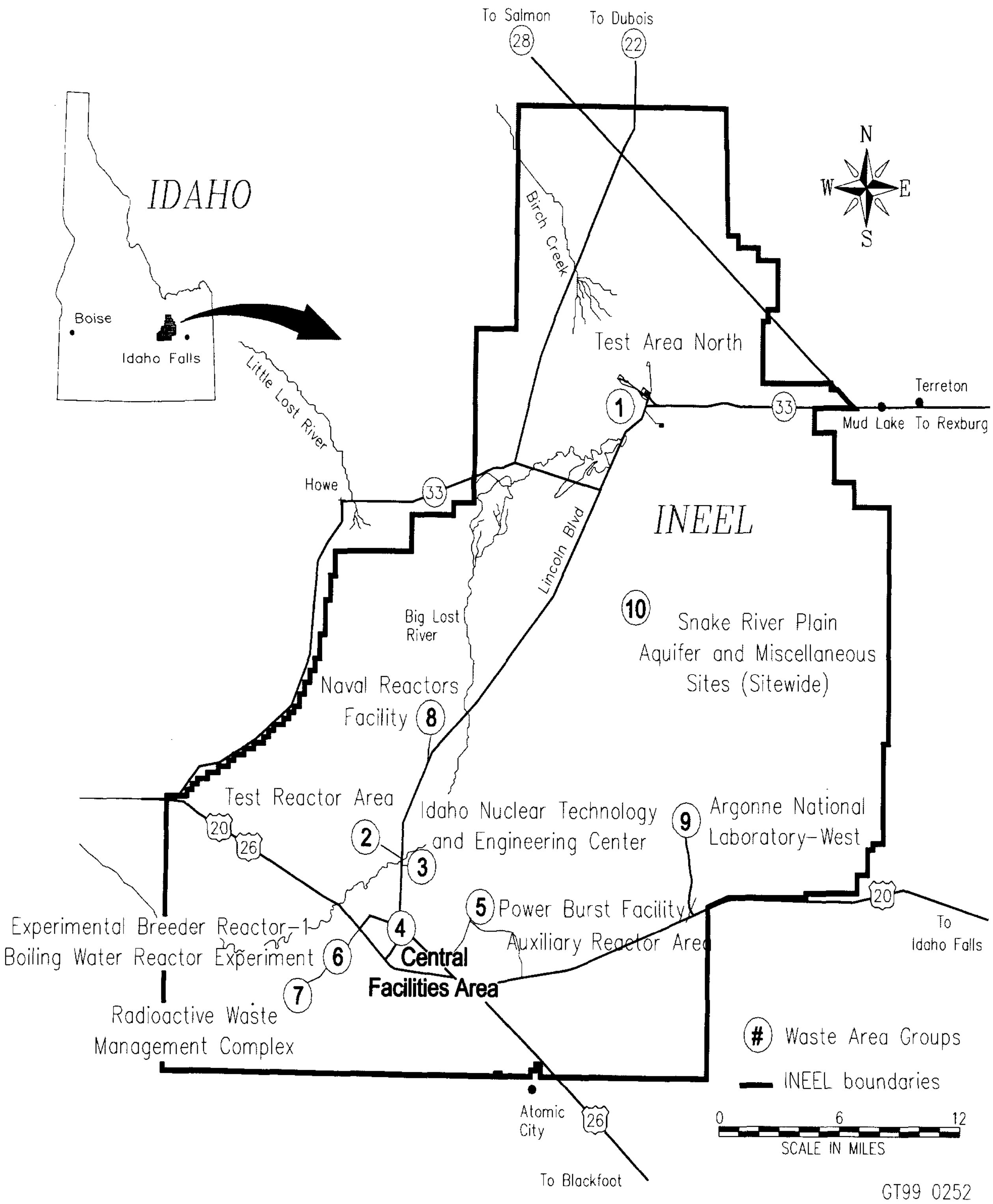

Figure 1-1. Idaho National Engineering and Environmental Laboratory.

Based on the results of the human health risk assessment, no contaminants of concern (COCs) were identified for the septic tank soils. The risk to human health at ARA-02 is attributed to the sludge remaining in the seepage pit. Using human health risk estimates, the COCs identified for the seepage pit sludge include Cs-137, Ra-226, U-235, U-238, Aroclor-1242, and lead. No COCs were identified for the septic tank soils based on the results of the ecological risk assessment. In addition, the seepage pit sludge is not available to ecological receptors. Because historical activities involving chlorinated solvents (i.e., 1,1,1-trichloroethane and trichloroethene) conducted at the ARA-I facilities resulted in contamination of the ARA-02 system, all wastes and materials coming into contact with those wastes will be designated as F-listed.

1.2.2 ARA-16 Radionuclide Tank

The ARA-16 site was a 3,785-L (1,000-gal) stainless steel underground holding tank resting within a lidless concrete vault and covered by approximately 1.1 m (3.5 ft) of soil. From 1959 to 1988, the tank received radioactive liquid waste, including wash water from the ARA-I hot cells; methanol, acetone, chlorinated paraffin; and mixed acids from materials testing, research, and metal-etching processes. Periodically, the contents of the tank were emptied into a tank truck and transported to the Idaho Nuclear Technology and Engineering Center (INTEC) (known as the Idaho Chemical Processing Plant at that time) for disposal. The ARA-I facility was formally shut down in 1988 and the tank was partially excavated. All lines into and out of the tank were cut and capped, and the contents were agitated and pumped out, leaving a small amount of residual liquid and sludge in the tank. Soil from the excavation was replaced over the tank.

Data from three investigations of the ARA-16 radionuclide tank contents were considered in the *Waste Area Group 5, Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999). These investigations included the following:

- The Track 1 assessment including data from the 1988 shutdown activities (Holdren 1988)
- Sampling conducted in 1994 and reported in the WAG 5 Work Plan (DOE-ID 1997, Appendix D)
- Additional characterization conducted in 1997 under the WAG 5 Work Plan reported in the RI/FS (Holdren et al. 1999).

Based on the 1997 data, the contents of the tank were classified as RCRA F-listed mixed waste and Toxic Substances Control Act (TSCA) regulated for polychlorinated biphenyls (PCBs), but not as transuranic waste. In addition to the tank sampling, samples were collected from boreholes drilled between the concrete vault and the tank, as well as outside the vault. Most of the contaminants detected in the tank waste were not detected outside of the tank, indicating that the tank had not leaked. The primary contributor to soil contamination in the area was the cleanup of the accident at Stationary Low-Power Reactor No. 1 (SL-1).

In accordance with the risk assessment protocol (INEL 1995), the contents of the tank were not quantitatively evaluated in the remedial investigation/baseline risk assessment because a release to the environment had not occurred. Therefore, the risk assessment was limited to evaluating the soil outside of the tank, with Cs-137 being identified as the only COC, based on human health risks. The site was eliminated from evaluation in the ecological risk assessment. Though no releases have occurred from the ARA-16 tank and the tank did not leak, the tank contents were identified as principal threat waste and could have posed an unacceptable risk if released to the environment. As such, the tank and associated piping were removed to mitigate this threat.

1.2.3 ARA-25 Soils beneath the ARA-626 Hot Cells

As part of the ongoing decontamination and dismantlement (D&D) activities at ARA-I, radiologically contaminated concrete floor slabs were cut out of the ARA-626 hot cells and disposed of at the Radioactive Waste Management Complex (RWMC). The concrete slabs were poured directly on the soil (about 15 cm [6 in.] thick). The soil under the west cell had contamination levels of 50,000 disintegrations per minute. A crack around this floor drain was observed while completing the D&D of the facility, which led to the high levels of radioactive contamination in the soil beneath the facility.

In 1998, the hot cells and floor slabs were removed and underlying soil was sampled. Three soil samples were collected in the area of the floor drains. After sampling, a fixative was applied to the exposed soil, and the roof of the hot cell building was placed on the ground over the area for shielding. Results from the analysis of the soil samples demonstrated that the contaminated soil at ARA-25 was not classified as RCRA-hazardous waste. Through review of process knowledge and analytical data, DOE, EPA, and IDEQ determined that ARA-25 soil was not classified as hazardous waste (Rose 1999).

Based upon results of the quantitative risk assessment in the WAG 5 comprehensive RI/FS (Holdren et al. 1999), arsenic, lead, Cs-137, and Ra-226 were identified as COCs based on human health risk estimates. In addition, copper and lead were identified as posing an unacceptable risk based upon the ecological risk assessment. It was decided that in removing the Cs-137 contamination, the other COCs would also be removed below risk levels.

1.2.4 Inactive Waste Systems

Four inactive waste systems were included for closure in the RD/RA as a best management practice. The ARA-II, ARA-III, and ARA-IV facilities that used these waste systems have been removed by the D&D Program and the waste systems were no longer in service. The four waste systems include ARA-II seepage pit to the east (ARA-720A) (ARA-07), ARA-II seepage pit to the west (ARA-720B) (ARA-08), ARA-III sanitary sewer distribution box and septic tank (ARA-740) (ARA-13), and ARA-IV test area septic tank and Leach Pit No. 2 (ARA-21). Brief descriptions of these systems are provided in Section 1.3. Detailed information about the individual sites can be found in the *Waste Area Group 5, Operable Unit 5-12 Comprehensive Remedial Investigation/Feasibility Study* (Holdren et al. 1999).

1.3 Physical Site Description

The following sections describe the ARA-02 Sanitary Waste System, ARA-16 radionuclide tank, the inactive waste system sites, and the ARA-25 soils and foundation.

1.3.1 ARA-02 Sanitary Waste System

The ARA-02 was a sanitary septic system that serviced the ARA-I facility from 1960 until 1988 (Figure 1-2). The ARA-02 site was defined as the entire septic system, including the three tanks (one septic tank, one settling tank, and one chlorine contact tank), the seepage pit, three manholes, and all associated piping leading from source buildings (both 10 and 20 cm [4 and 8 in.] diameter), as well as any contiguous soil contaminated from system materials. The septic system serviced ARA-I Buildings 626, 627, and 628 and Office Trailers No. 1 and 2 outside the ARA-I facility fence. The vertical extent of the site was defined by the depth to the soil/basalt interface.

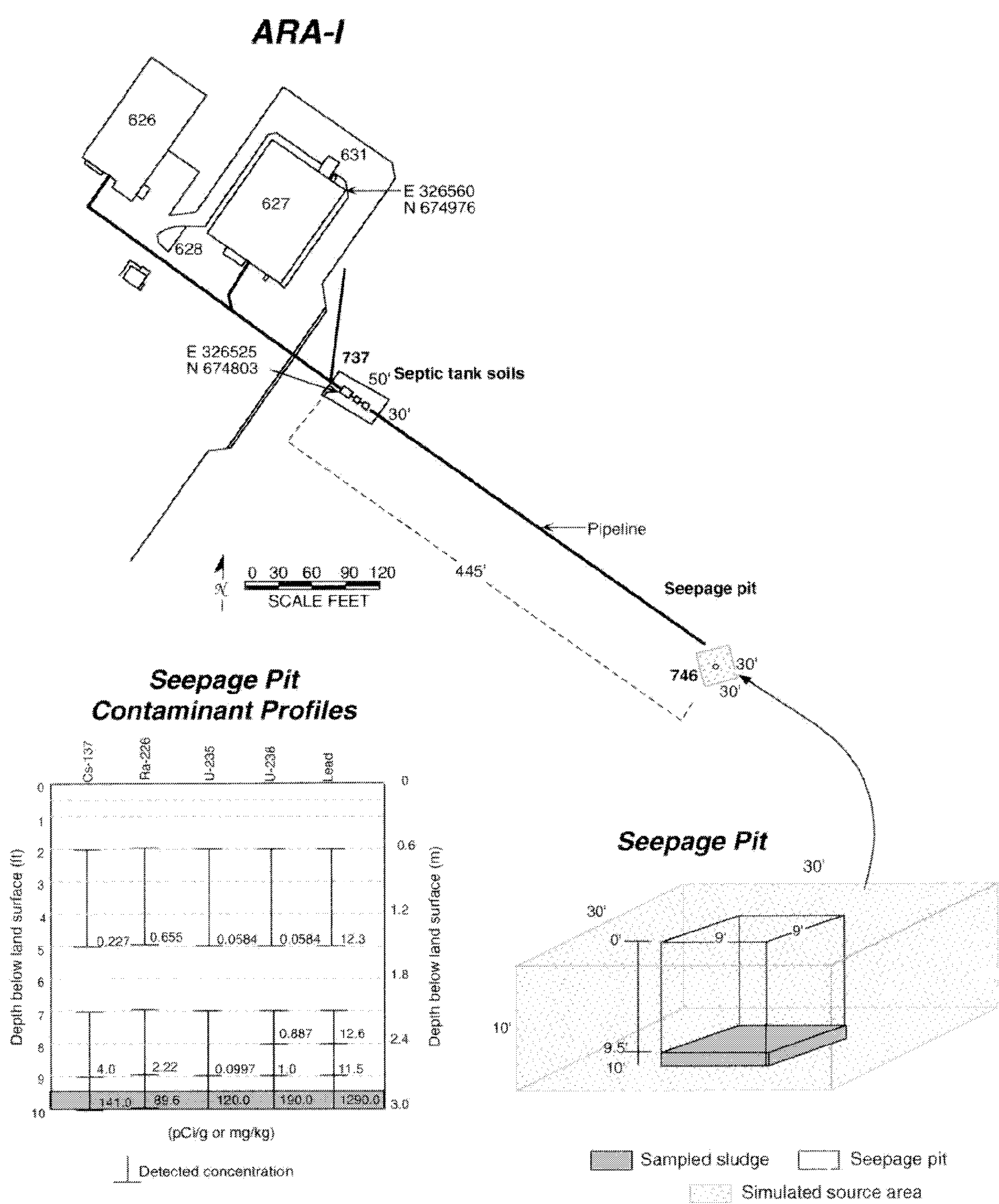

Figure 1-2. ARA-02 sanitary septic system.

The ARA-02 sanitary waste system included 10.1-cm (4-in.) diameter piping leading from each of the aforementioned buildings and trailers into a 20.3-cm (8-in.) diameter concrete main with mechanical joints, three septic tanks, and an associated seepage pit discharge point. Three manholes allowed access to the 20.3-cm (8-in.) diameter concrete main. The 20.3-cm (8-in.) diameter main continued eastward to the seepage pit. The third manhole accessed the mainline pipe approximately halfway between the second manhole and the seepage pit. The mainline laid approximately 1.0 to 1.2 m (3.3 to 4 ft) below ground surface (bgs) along its entire length of approximately 218 m (715 ft).

The tanks laid approximately 1.1 m (3.5 ft) bgs. The first tank in the series was approximately 3 m (10 ft) east of the second manhole. The first tank was a septic tank constructed of concrete and had 1.5-m (5-ft) vertical depth and a 3,029-L (800-gal) capacity. The second concrete settling tank laid approximately 0.3 m (1 ft) east of the first tank, had a capacity of 1,893 L (500 gal), and was approximately the same depth as the first tank. The third tank was a 1,893-L (500-gal) capacity precast chlorine contact tank located approximately 0.3 m (1 ft) further east of the second tank and again at the same depth. The construction of the three tanks allowed for a maximum accumulation of 1.2 m (4 ft) of liquids and sludges, with a 0.3-m (1-ft) air space above the mainline inlet and outlets. The tanks were accessed by means of two rectangular concrete ports located directly above the baffles near each end of the tanks.

The mainline piping continued eastward from the chlorine contact tank to the third manhole, a distance of approximately 67 m (220 ft) from the second manhole. The seepage pit was located an additional 69 m (226 ft) east of the third manhole. The seepage pit was accessed via a cast iron manhole approximately 0.8 m (2.5 ft) bgs. The top of the mainline pipe inlet to the seepage pit lied approximately 1.1 m (3.6 ft) bgs (assuming a 0.2-m [0.75-ft] overburden depth). The seepage pit was constructed of 20.3-cm (8-in.) open dry-joint pumice blocks lying on concrete pilings 1.8 m (6 ft) below the mainline tract. Screened gravel (3.8 cm [1.5 in.] in size), 0.4-m (1.3-ft) thick, surrounded the seepage pit below the mainline inlet, while a 0.3-m (1-ft) thick gravel bed laid below the open base of the pit.

1.3.2 ARA-16 Radionuclide Tank

Located at ARA-I, the ARA-16 radionuclide tank was a 3,785-L (1,000-gal) stainless steel underground tank that rested on a 15-cm (6-in.) gravel bed inside an open-topped concrete vault (Figure 1-3). The tank was 3.66 m (12.0 ft) long and approximately 1.2 m (4 ft) in diameter. The external dimensions of the vault and configuration of the tank within the vault are provided on Drawing Sheet SK-6 on page A-8 of Appendix A. The tank had been partially excavated in the past for sampling; therefore, the depth of the fill material varied from the original design.

The tank had several piping connections and a manway cover. A pump and all external piping were removed from the tank, and a 10-cm (4-in.) diameter inlet pipe, which extended out the end of the tank and through which waste entered the tank, was cut just outside the concrete vault with the ends capped off. An isolation valve was located just beyond the cut inlet pipe on piping, which came from the ARA-I facility hot drains. From where the pump was removed, the 15-cm (6-in.) diameter pump suction line was blind flanged at approximately 91 cm (36 in.) below grade. A 5-cm (2-in.) diameter line and a 3.8-cm (1.5-in.) diameter line next to the manhole were cut approximately 61 cm (24 in.) above the tank and capped. Two 3.175-cm (1.25-in.) diameter pipe nipples were also located next to the manhole. A 5-cm (2-in.) diameter line and a 2.54-cm (1-in.) diameter line that were welded to the manhole were cut approximately 46 cm (18 in.) above the tank and blind flanged.

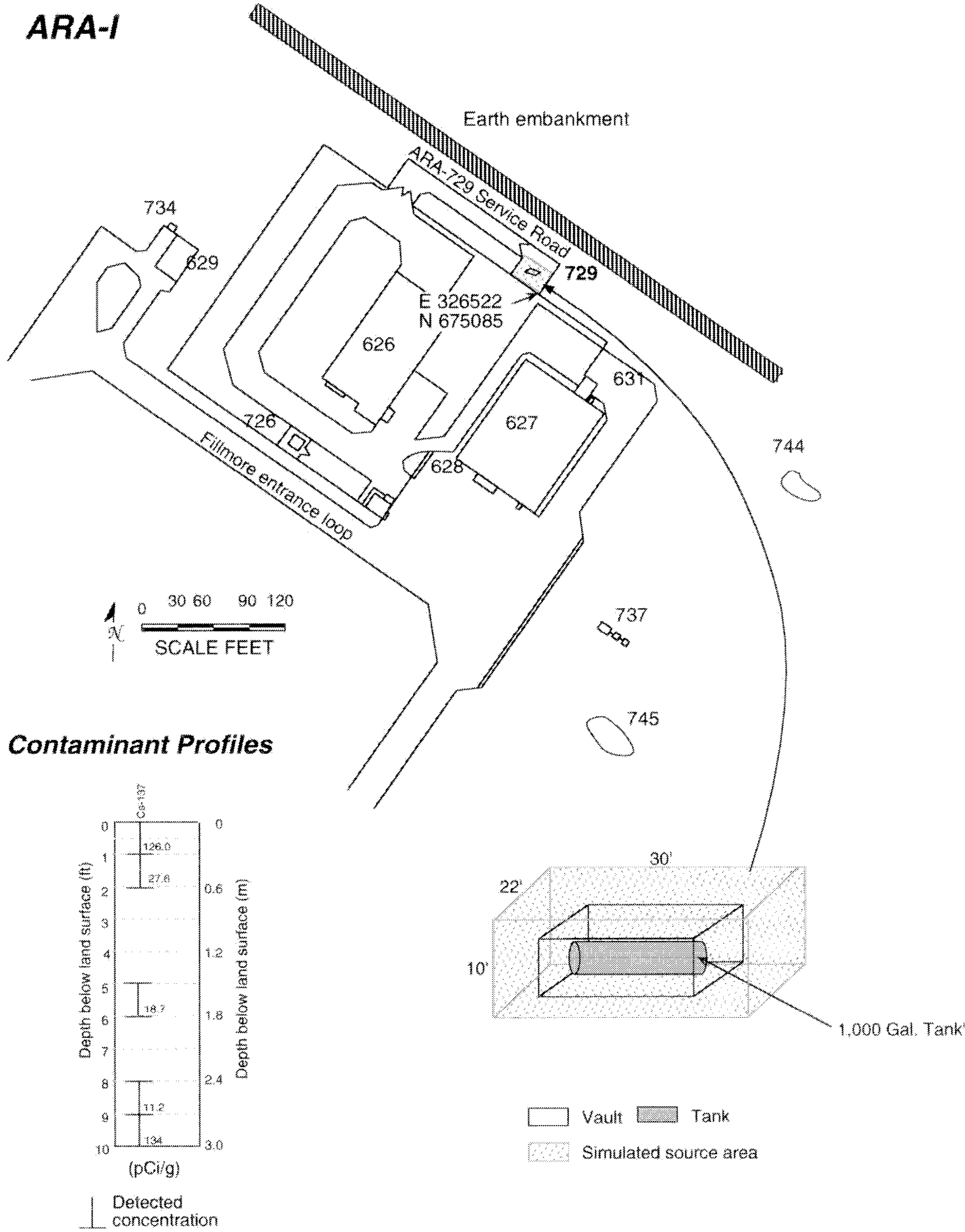

Figure 1-3. ARA-16 radionuclide tank.

The ARA-16 radionuclide tank was connected to the ARA-626 and ARA-627 buildings within the ARA-I facility via stainless steel piping. The ARA-627 building's drainline was a 10-cm (4-in.) diameter pipe with a length of 32 m (105 ft). This line was connected by a Y-joint to a 10-cm (4-in.) diameter pipe that ran 68 m (223 ft) to the ARA-626 hot cell. Within the ARA-626 service area were a series of drainlines including 14 m (47 ft) of 10-cm (4-in.) diameter pipe and 39 m (127 ft) of 5-cm (2-in.) diameter pipe.

1.3.3 ARA-25: ARA-I Soil beneath the ARA-626 Hot Cells

The ARA-25 site was comprised of contaminated soil that was discovered beneath the ARA-626 hot cells during the D&D of the ARA-I facility in 1998 (Figure 1-4). The contamination was found near the hot cell floor drains. The contaminated area immediately around the drains measured approximately 2.4 × 3.7 m (8 × 12 ft). However, other isolated hot spots beneath the building were also discovered. Therefore, a cumulative size of 4.9 × 7.3 m (16 × 24 ft) was estimated for the site.

The ARA-I hot cells were constructed in 1959 and used until the facility was shut down in 1988. Stainless steel piping connected the floor drains to the ARA-729 radionuclide tank (Site ARA-16). The pipes were included in the remediation of Site ARA-16 and were not a component of the ARA-25 site.

1.3.4 Inactive Waste Systems

1.3.4.1 ARA-07: ARA-II Seepage Pit to the East (ARA-720A). The ARA-07 seepage pit (Figure 1-5) was constructed of 20.3 × 20.3 × 40.6-cm (8 × 8 × 16-in.) pumice blocks laid on their side in the shape of a circle. The seepage pit had a diameter of 4 m (13 ft) and a depth of 3.0 m (10 ft). The top two courses of pumice blocks were set in mortar. The as-built drawing (#102832) shows the first course of blocks to be set on bedrock leveled with concrete. The pit had a gravel base and contained approximately 15 to 30 cm (6 to 12 in.) of sludge. The top of the pit extended above the ground and was covered by a wooden roof with lifting rings and a 0.6 × 0.6-m (2 × 2-ft) square access port. A 1.2-m (4-ft) high chain-link fence surrounded the entire structure.

The seepage pit lied just outside of the ARA-II facility fence and was the terminus of two septic tanks serving the Administration Building (Building 613) and the Technical Support Building (Building 602). The seepage pit was also thought to be the terminating point for an underground waste detention tank (ARA-719), which was removed during D&D activities discussed in the *Final Report of the Decontamination and Dismantlement of the Auxiliary Reactor Area II Facility* (INEEL 1999). The system was in use from approximately 1959 to 1986.

1.3.4.2 ARA-08: ARA-II Seepage Pit to the West (ARA-720B). The ARA-08 seepage pit (Figure 1-5) was an inactive seepage pit with a diameter of 4 m (13 ft) and a depth of 3 m (10 ft). The pit was constructed of 20.3 × 20.3 × 40.6-cm (8 × 8 × 16-in.) pumice blocks laid on their side in the shape of a circle. The top two courses of pumice blocks were set in mortar. The pit had a gravel base and contained approximately 46 to 61 cm (18 to 24 in.) of sludge. Three separate concrete slabs measuring approximately 0.9 m (3 ft) wide by 3.0 m (10 ft) long capped the pit. The pit was covered by approximately 0.9 m (3 ft) of soil.

The seepage pit lied just outside of the ARA-II facility fence and received wastes from the Administrative and Technical Support Building (Building 606). The system was in use from approximately 1959 to 1986.

1.3.4.3 ARA-13: ARA-III Sanitary Sewer Leach Field and Septic Tank (ARA-740). The ARA-13 site consisted of a manhole, a septic tank, a distribution box, and a leach field (Figure 1-6). Sanitary waste was disposed of into the system from 1969 to 1980. In addition to sanitary waste, small quantities of laboratory waste were diverted to this system between 1980 and 1983.

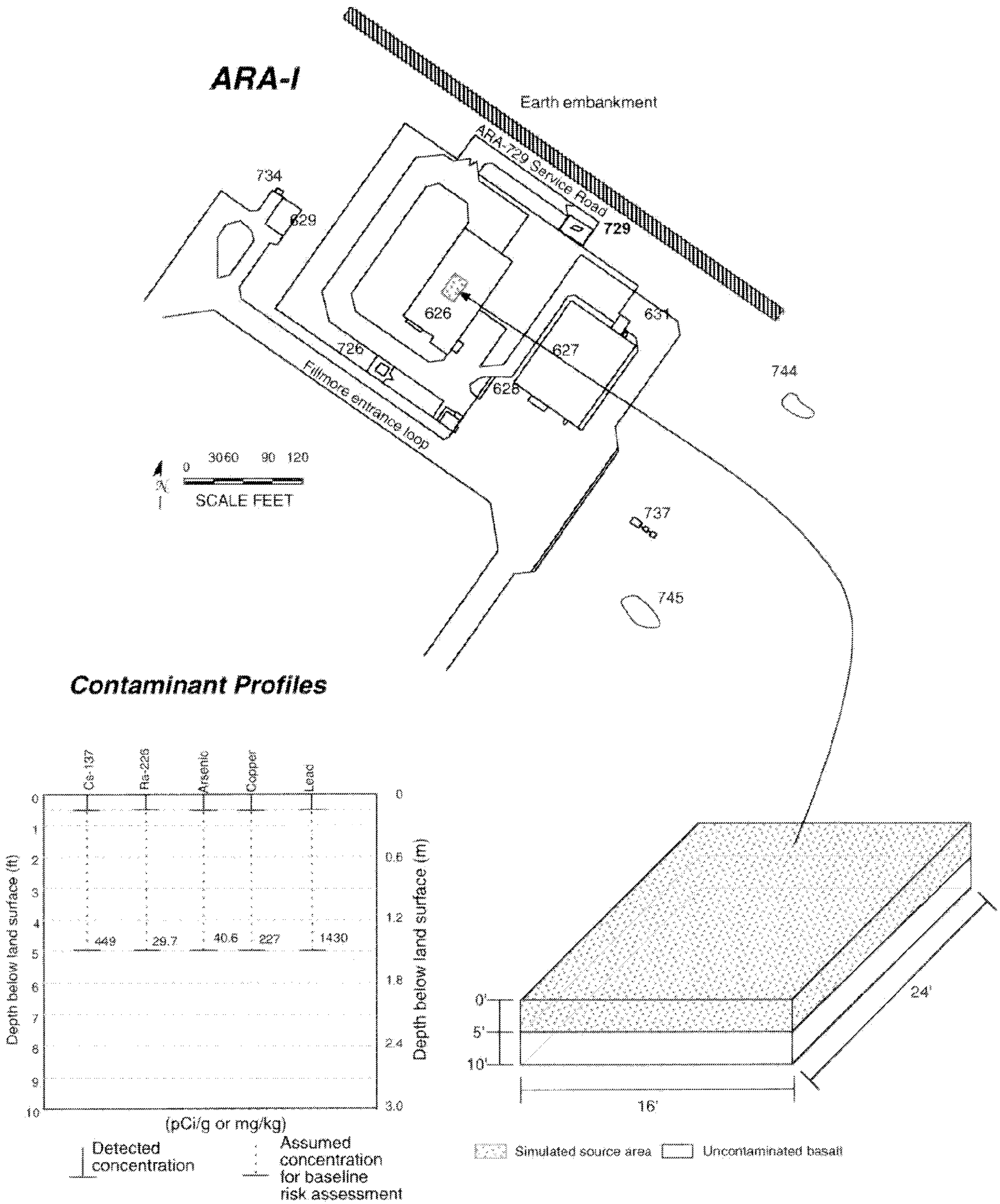

Figure 1-4. ARA-25 soils beneath the ARA-626 hot cells.

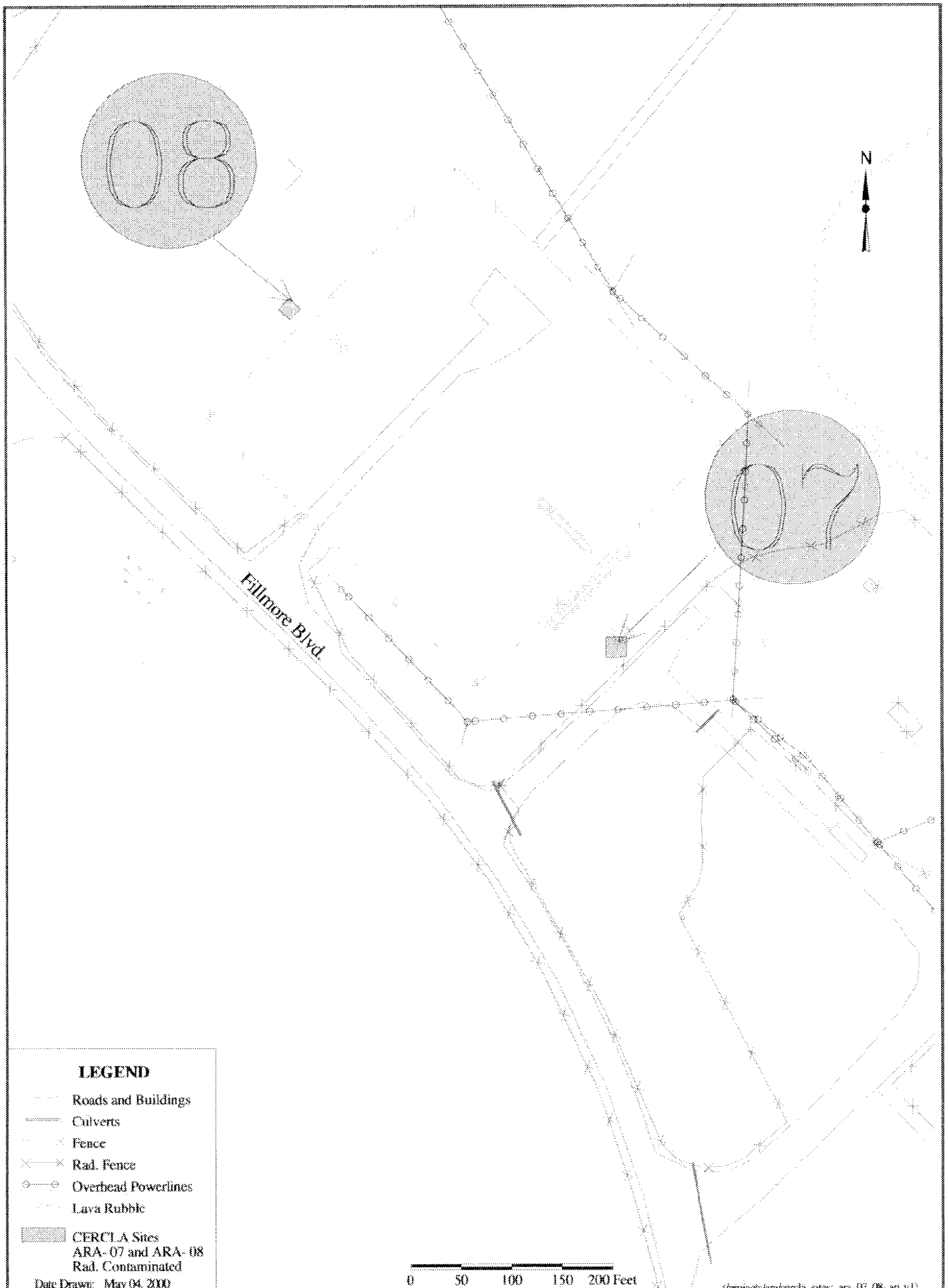

Figure 1-5. ARA-07 and ARA-08 seepage pits.

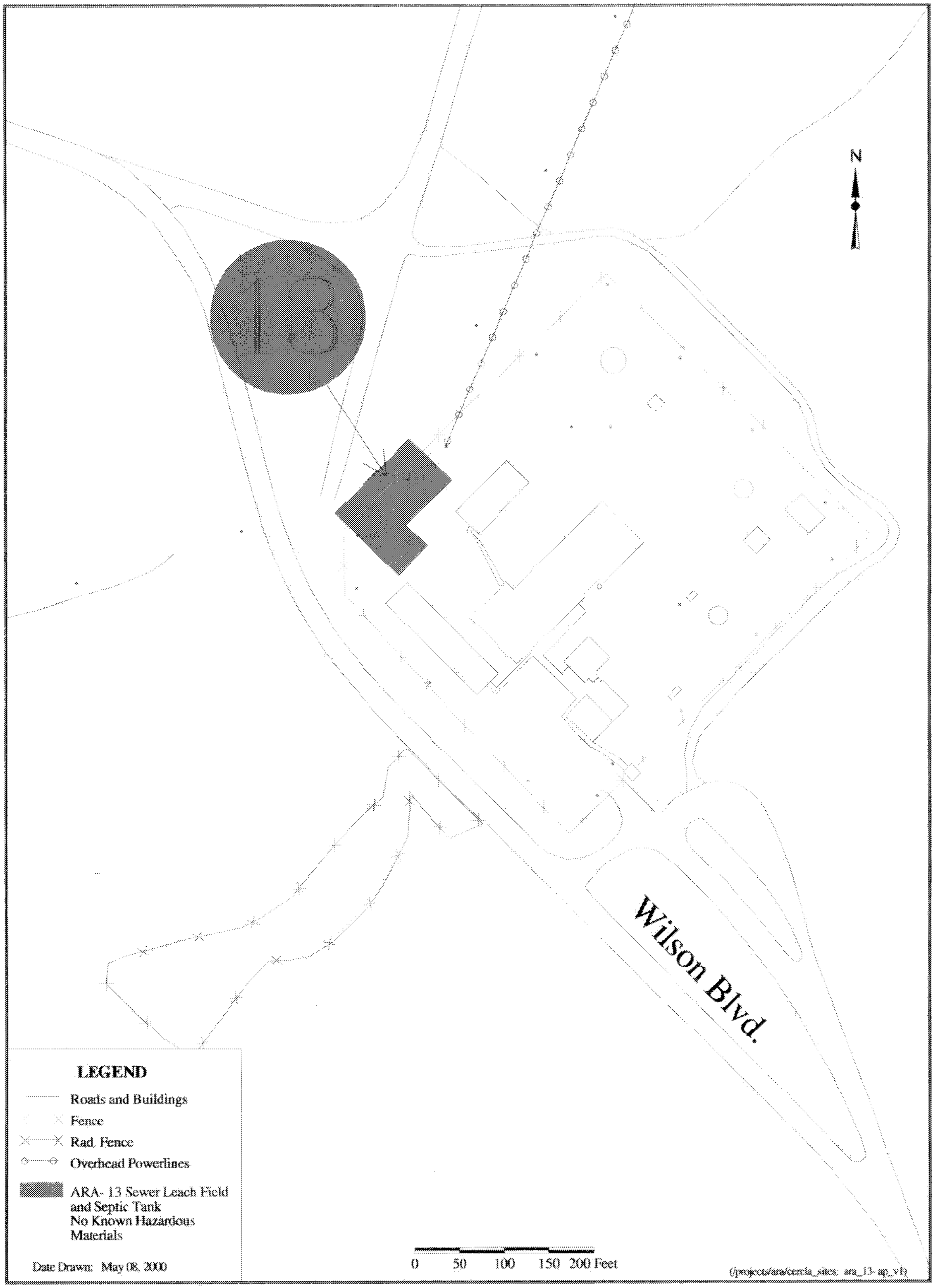

Figure 1-6. ARA-13 sanitary sewer leach field and septic tank.

The concrete manhole was approximately 1.5 m (5 ft) in diameter and extended approximately 1.2 m (4 ft) below grade. It had two inlets and a single outlet. The septic tank was rectangularly shaped and was 7.0 m (23 ft) long, 1.8 m (6 ft) wide, and 1.8 m (6 ft) high with an approximate volume of 23,500 L (6,200 gal). The concrete septic tank was buried approximately 1.5 m (5 ft) bgs, directly on top of basalt that had to be blasted and excavated during installation. Effluent from the septic tank drained into a metal distribution box with dimensions of 2.7 m (9 ft) long, 1.5 m (5 ft) high, and 1.0 m (3.25 ft) wide with a volume of 4.1 m^3 (5.4 yd^3). The distribution box had nine screened outlets that drained into the 465-m^2 (5,000-ft^2) leach field.

1.3.4.4 ARA-21: ARA-IV Test Area Septic Tank and Leach Pit No. 2. The ARA-21 site (Figure 1-7) consisted of a 3,785-L (1,000-gal) underground septic tank, an estimated 946- to 1,892-L (250- to 500-gal) chlorine contact tank, and a seepage pit that received sanitary waste from the ARA-IV Test Area Building (ARA-616). The system was used from approximately 1957 to 1970. During D&D operations in 1987, the piping was cut 3.0 m (10 ft) from the building, and the tanks and leach pit were covered with 1.8 m (6.0 ft) of soil.

1.4 Remedial Action Objectives

The remedial action objectives (RAOs) for OU 5-12 were developed in accordance with the *National Oil and Hazardous Substances Contingency Plan* (EPA 1990) and are based on the results of the human health and ecological risk assessments, as outlined in the *Final Record of Decision for Power Burst Facility and Auxiliary Reactor Area* (DOE-ID 2000a). The intent of the RAOs is to set goals for the protection of human health and the environment. The following sections describe the RAOs for ARA-02, ARA-16, and ARA-25 based upon the decisions in the ROD (DOE-ID 2000a). The four inactive tank sites (ARA-07, ARA-08, ARA-13, and ARA-21) are not specifically described in these sections since the ROD (DOE-ID 2000a) defines these as “No Action” sites with the recommendation that the components either be removed or abandoned in place. No RAOs are associated with these inactive tank sites.

In general, the following land-use assumptions, consistent with the INEEL Comprehensive Facility and Land Use Plan, were used in the development of the remedial action objectives for WAG 5 remediation:

- Institutional controls until 2095 will include current security controls, site access controls, radiological controls, and worker monitoring

- For 2095 and beyond, homes could be built anywhere within WAG 5 and a water supply well could be drilled adjacent to the home.

The RAOs developed for each radiologically contaminated site assume that institutional controls will remain in place for a maximum period of 100 years and the radioactive constituents will decay to a level that will be protective of human health from that point forward.

1.4.1 ARA-02 Sanitary Waste System

Remediation objectives, based on the risks discussed in the ROD (DOE-ID 2000a), were developed for the ARA-02 sanitary waste system. A summary of the implementation of the remediation objectives is provided in Section 2.3.2.1. No unacceptable ecological risk is associated with the system. Human health risk in excess of 1E-04 is posed primarily by external exposure to ionizing radiation. The radioactive contaminants of concern are Cs-137, Ra-226, U-235, and U-238. Dermal adsorption and ingestion of PCBs and ingestion of lead pose secondary human health risks.

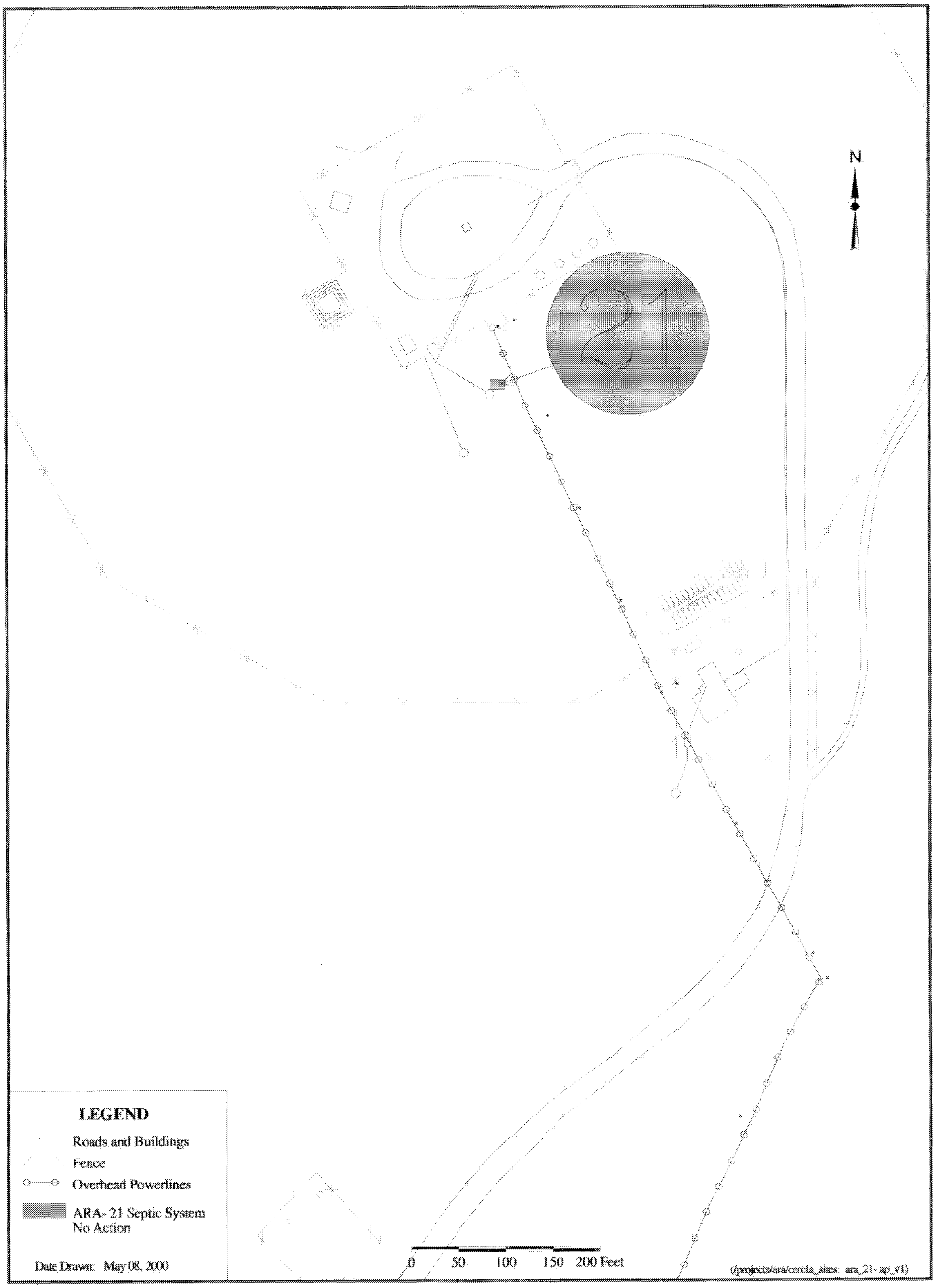

Figure 1-7. ARA-21 Test Area IV Septic Tank and Leach Pit No. 2.

The RAOs for the ARA-02 sanitary waste system apply only to the ARA-02 seepage pit sludge because all COCs at the site are contained within the sludge. The following RAOs were developed to protect human health:

- Inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and future residents

- Inhibit dermal adsorption of COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 or a hazard index of 2 or greater for current and future workers and future residents.

To meet these objectives, remediation goals were established. Remediation goals can be satisfied by either cleaning up to the identified contaminant concentration (see Table 1-1) or by removing all contaminated media down to the basalt interface. Removing the seepage pit contents down to basalt will be protective because surface exposure pathways will be eliminated. The RI/FS for WAG 5 (Holdren et al. 1999) showed that groundwater exposure pathways pose a cumulative risk less than 1E-04 and a hazard index less than 1 for the baseline no action alternative. Removal of contaminated media from WAG 5 will further reduce the potential groundwater risk. Therefore, remediation to retrieve residual contamination that may have migrated into the fractured basalt would not be justified.

Table 1-1. Remediation goals for the ARA-02 sanitary waste system.

Contaminant of Concern	Soil Concentration Remediation Goal
Cs-137	8.5 pCi/g
Ra-226	1.2 pCi/g
U-235	6.2 pCi/g
U-238	10.6 pCi/g
Aroclor-1242	1 mg/kg
Lead	400 mg/kg

1.4.2 ARA-16 Radionuclide Tank

Remediation objectives, based on the risks discussed in the ROD (DOE-ID 2000a), were developed for the soil at the ARA-16 radionuclide tank. A summary of the implementation of the remediation objectives is provided in Section 2.3.2.5. Human health risk of 1E-04 is posed primarily by external exposure to ionizing radiation from Cs-137. In addition, remediation will be applied to address the principal threat waste contained in the tank.

Because a release to the environment had not occurred, the contents of the radionuclide tank were not quantitatively evaluated in the remedial investigation/baseline risk assessment. Therefore, the risk assessment was limited to evaluating the soil outside the tank. Cesium-137 was the only contaminant of concern identified for the ARA-16 site based on human health risks. The total estimated risk for the 100-year future residential scenario for the soil around the tank was 1E-04 (1 in 10,000) from Cs-137. The noncarcinogenic hazard quotient for residential exposure was less than 1.0. The total estimated risk for all pathways for the current occupational scenario was 3E-04 with a hazard index for the current occupational exposure of less than 1.0. The total estimated risk for all pathways for the 100-year occupational scenario was 1E-04 (1 in 10,000) with the primary contributor being Cs-137. The noncarcinogenic hazard index for the future occupational exposure was less than 1.0.

The human health threat posed by the radioactively contaminated soil and gravel in and around the ARA-16 tank vault is external exposure to ionizing radiation. No unacceptable ecological risk is associated with this site. The RAO developed for the soil and gravel is to inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and for future residents. To meet this goal, a remediation goal of 23 pCi/g for Cs-137 was established. In addition, remediation was applied to address the principal threat waste contained in the tank.

Though no releases have occurred from the ARA-16 tank and the tank is not leaking, the tank contents are identified as principal threat waste and could pose an unacceptable risk if released to the environment. Therefore, an additional RAO was developed to prevent release of the tank contents and preclude human and ecological exposures to the ARA-16 tank contents.

1.4.3 ARA-25 Soils and Foundation Walls

Remediation objectives based on risks, as described in the ROD (DOE-ID 2000a), were developed for ARA-25. A summary of the implementation of the remediation objectives is provided in Section 2.3.2.7. Human health risk in excess of 1E-04 is posed primarily by external exposure to ionizing radiation. The radioactive contaminants of concern are Cs-137 and Ra-226. Dermal adsorption of arsenic and ingestion of Ra-226, arsenic, and lead pose secondary human health risks. Ecological hazard quotients greater than 10 are from exposure to copper and lead in the soil.

The following land-use assumptions were used in the development of the remedial action objectives for WAG 5 remediation:

- Institutional controls until 2095 will include current security controls, site access controls, radiological controls, and worker monitoring. An Institutional Control Plan has been included with the WAG 5 RD/RA Phase II Work Plan.

- For 2095 and beyond, homes could be built anywhere within WAG 5 and a water supply well could be drilled adjacent to the home.

The following remedial action objectives were developed to protect human health and the environment for ARA-25:

- Inhibit direct exposure to radionuclide COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for current and future workers and future residents

- Inhibit dermal adsorption of COCs that would result in a total excess cancer risk greater than or equal to 1 in 10,000 or a hazard index of 2 or greater for current and future workers and future residents

- Inhibit ecological receptor exposures to contaminated soil with concentrations of contaminants greater than or equal to 10 times background values and that result in a hazard quotient greater than or equal to 10.

To meet these objectives, remediation goals were established (see Table 1-2). Remediation goals can be satisfied by either cleaning up to the identified contaminant concentration or by removing all soil down to the basalt interface. Removing soil down to basalt will be protective because surface exposure pathways will be eliminated. The RI/FS for WAG 5 (Holdren et al. 1999) showed that groundwater exposure pathways pose a cumulative risk less than 1E-04 and a hazard index less than 1 for the baseline no action alternative. Therefore, remediation to retrieve residual contamination that may have migrated into the fractured basalt would not be justified. It was estimated that approximately 54 m^3 (71 yd^3) of soil from ARA-25 would require remediation.

Table 1-2. Remediation goals for ARA-25.

Contaminant of Concern	Soil Concentration Remediation Goal
Arsenic	5.8 mg/kg
Cs-137	23 pCi/g
Ra-226	1.2 pCi/g
Copper	220 mg/kg
Lead	400 mg/kg

1.5 Selected Remedy

The Agencies selected the following remedies for the Phase I sites listed in Table 1-3 based upon consideration of the requirements of the detailed analysis of alternatives, public comments, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Performance standards were implemented as design criteria for each site to ensure that the selected remedy protects human health and the environment. Five-year reviews will be used to ensure that the selected remedies remain protective and appropriate. Table 1-3 provides a summary of the selected remedies for the WAG 5 Phase I sites.

Table 1-3. Summary of the selected remedies.

Site	Selected Remedy
ARA-02 Sanitary Waste System	Removal and off-Site disposal.
ARA-07—ARA-II Seepage Pit to the east	Remove and dispose wooden cover and aboveground blocks at an approved on-Site facility. Remove and recycle chain-link fencing. Backfill pit with earthen materials.
ARA-08—ARA-II Seepage Pit to the west	Remove and dispose of concrete slabs at an approved on-Site facility. Backfill pit with earthen materials.
ARA-13—ARA-III Sanitary Sewer Leach Field and Septic Tank	Sample tank, manhole, and distribution box contents. Based on sampling results, either: (a) Remove and dispose of manhole, septic tank, distribution box, and contents at an approved off-Site facility, or (b) Remove and dispose of contents at appropriate disposal facilities. Abandon all physical components in place.
ARA-16 Radionuclide Tank (Three options)	<u>Option 1</u> Remove the ARA-16 radionuclide tank and contents intact. Remove the sectioned associated piping. Ship for off-Site thermal treatment and disposal. Excavate the concrete vault and dispose at an approved facility based on sampling results. <u>Option 2</u> Remove the ARA-16 radionuclide tank contents for shipment to an off-Site facility for thermal treatment and disposal. Decontaminate and excavate the tank and associated piping and dispose at the RWMC. Excavate the concrete vault and dispose at an approved facility based on sampling results. <u>Option 3</u> Place ARA-16 tank and contents in a low-risk state by performing the following activities: • Remove tank contents. • Separate the liquid from the sludge. Filter the liquid to remove contaminants, as appropriate, and place the liquid into an approved container(s). Dewater the sludge to the extent practicable.

Table 1-3. (continued)

Site	Selected Remedy
	• Meet the disposal facility acceptance requirements for liquid or stabilized liquid. For stabilization, the liquid will be solidified using grout or another approved solidification agent (such as Radsorb). Ship the waste to the INEEL CERCLA Disposal Facility (ICDF) or another approved on- or off-Site disposal facility. • Store dewatered sludge phase in a TSCA/RCRA-approved storage area until an approved Treatment, Storage, and Disposal Facility (TSDF) is available to accept the waste. • Encapsulate tank, ancillary piping, and equipment for shipment to the ICDF or another approved on- or off-Site disposal facility.
ARA-21—ARA-IV Test Area Septic Tank and Leach Pit No. 2	Sample tank and chlorine contact tank contents. Based on sampling results, either: (a) Remove and dispose of tank, chlorine contact tank, and contents at an approved off-Site facility, and abandon the seepage pit in place, or (b) Abandon all components in place.
ARA-25 Soils beneath the ARA-626 Hot Cells	Remove and dispose of roof structure at an approved on-Site facility. Remove and dispose of concrete foundation and soils at an approved on-Site facility.